PATENT SPECIFICATION

Application Date: Feb. 4, 1936. No. 3365/36. **469,771**

Complete Specification Left: March 4, 1937.

Complete Specification Accepted: Aug. 3, 1937.

PROVISIONAL SPECIFICATION

Improvements in Sugar Crystallizing and like Apparatus

I, JAMES MILLER, of British Nationality, c/o Barclays Bank, Limited, Derby, do hereby declare the nature of this invention to be as follows:—

This invention relates to sugar crystallizers and the like of the kind comprising a stationary container with a revolving shaft carrying stirring devices for giving motion to the liquor contained therein.

In such apparatus it is known to provide a moving cooling or heating surface in the form of coils or banks of pipes through which the heating or cooling fluid is passed and which are so arranged as to impart motion to the liquor. In sugar crystallizers the cooling effect from the surface provided and the movement given to the massecuite by such surfaces facilitates and expedites crystallization of the sugar.

Where the container is long it is usually necessary to provide within it one or more intermediate bearings to support the shaft and the cooling pipes and so on so that it is necessary to carry the cooling or heating medium such as water or the like through these intermediate bearings and to provide pipes external to the shaft leading to or from such intermediate bearings.

In accordance with a feature of the present invention the need for these external pipes and the need for intermediate bearings with water connections is avoided by forming the shaft from standard rolled sections assembled by welding to present longitudinal channels or passages separated by a central partition and providing respectively for the supply and exhaust of the cooling medium to the coils or banks of pipes.

The shaft may be formed of rolled sections in various ways. For instance, it may consist of two channel sections facing one another with an interposed plate forming the diaphragm or partition. It may be constituted by an **H** beam with plates welded to the flanges, the central web forming the partition. It might be formed of two channel members riveted back to back with cover plates welded thereto forming the closing surfaces or it might be formed of spaced channel members oppositely disposed and connected by an **H** beam the flanges of the channel sections forming with the beam the passages closed by plates welded to the flanges.

Trunnions are formed on the end of the shaft serving as inlet and outlet of the cooling or heating medium respectively, these trunnions running in bearings attached to the end plates of the container.

With this form of central shaft any number of coils or banks of coils can be provided and the cooling or heating medium may enter or leave the cooling or heating surface where desired and run in any direction lengthwise of the vessel while entering at one end of the vessel and leaving at the opposite end. The trunnion carrying the inlet water cooling or heating medium is connected to one channel only and the other trunnion to the exhaust channel.

Conveniently there are provided spiral tubular coils of suitable material one or more sets of which may approximate to a diameter slightly less than the diameter of the container. The cooling or heating medium may enter these coils simultaneously at any desired position along the length of the shaft by connecting up one end of each of the above coils at any point on the shaft to the inlet channel of the shaft, the other end of the coil being conveniently connected at any convenient point on the shaft to the exhaust channel of the shaft.

The coils may be all of right hand spiral or left hand spiral or a combination of both.

Preferably one or more series of smaller coils are disposed within the container at suitable lesser diameters and of opposite hand to the adjacent larger diameter coils referred to providing for the passage of the cooling or heating medium in the opposite directions and moving the liquor within the container correspondingly to the right or left.

The spiral coils will be supported from the centre shaft by suitable arms and runners.

Scraping paddles conveniently attached

[*Price* 1/-]

to the coils adjacent the inside wall of the container may be provided to sweep the inner surface of the container and prevent building up of crystals on the stationary surfaces.

While with the improved construction of shaft intermediate bearings with water connections are unnecessary I may provide stirrup or other bearings supporting the shaft intermediate its length.

Dated this 4th day of February, 1936.

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and
86, St. Vincent Street, Glasgow,
Agents for the Applicant.

COMPLETE SPECIFICATION

Improvements in Sugar Crystallizing and like Apparatus

I, JAMES MILLER, of British Nationality, c/o Barclays Bank, Limited, Derby, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to sugar crystallizers and the like of the kind comprising a stationary container with a revolving shaft carrying stirring devices for giving motion to the liquor contained therein.

In such apparatus it is known to provide a moving cooling or heating surface in the form of coils or banks of pipes through which the heating or cooling fluid is passed and which are so arranged as to impart motion to the liquor. In sugar crystallizers the cooling effect from the surface provided and the movement given to the massecuite by such surfaces facilitates and expedites crystallization of the sugar.

Where the container is long it is usually necessary to provide within it one or more intermediate bearings to support the shaft and the cooling pipes and so on, so that it is necessary to carry the cooling or heating medium such as water or the like through these intermediate bearings and to provide pipes external to the shaft leading to or from such intermediate bearings.

In accordance with the present invention the need for these external pipes and the need for intermediate bearings with water connections is avoided by forming the shaft from standard rolled sections and plates assembled in a fluid tight manner to present longitudinal channels or passages separated by a central partition and providing respectively for the supply and exhaust of the heating or cooling medium to the coils or banks of pipes.

The shaft may be formed of rolled sections in various ways. For instance, it may consist of two channel sections facing one another with an interposed plate forming the diaphragm or partition. It may be constituted by an **H** beam with plates welded to the flanges, the central web forming the partition. It might be formed of two channel members riveted or otherwise secured back to back with cover plates welded thereto forming the closing surfaces or it might be formed of spaced channel members oppositely disposed and connected by an **H** beam the flanges of the channel sections forming with the beam the passages closed by plates welded to the flanges.

Trunnions are formed on the end of the shaft serving as inlet and outlet of the cooling or heating medium respectively, these trunnions running in bearings attached to the end plates of the container.

With this form of central shaft a plurality of coils or banks of coils can be provided and the cooling or heating medium may enter or leave the cooling or heating surface where desired and run in any direction lengthwise of the vessel while entering at one end of the vessel and leaving at the opposite end. The trunnion carrying the inlet water cooling or heating medium is connected to one channel only and the other trunnion to the exhaust channel.

In the accompanying drawings Fig. 1 illustrates somewhat diagrammatically a longitudinal cross section through a sugar crystallizer having two banks of cooling or heating coils mounted on a shaft and constructed in accordance with the present invention, while Fig. 2 shows a cross section through the sugar crystallizer. Fig. 3 is a detail to enlarged scale showing one end of the shaft and an associated trunnion while Fig. 4 is a section on the line IV—IV of Fig. 3. Figs. 5 and 6 illustrate in cross section two shafts made up from other forms of standard section in accordance with the present invention, while Fig. 7 shows a detail of a suitable means for the attachment of the coils to supporting arms.

Referring now to Figs. 1 to 4 of the drawings, a shaft of the crystallizer which shaft is indicated generally by the reference numeral 1 in Figs. 3 and 4 is built up of a beam 2 of **H** section with plates 3 welded to the flanges 4, the central web 5 provid-

ing a partition or diaphragm dividing the shaft 1 into two longitudinal passages 6 and 7 for heating or cooling medium. Each end of the shaft 1 is provided with a trunnion 8, one trunnion serving as an inlet for the heating or cooling medium by way of an offset port 9 to the passage 7 while the other trunnion serves as an outlet for the cooling or heating medium by way of a similar port in register with the passage 6. The trunnions 8 run in bearings (not shown) mounted in the end plates 10 of the sugar crystallizer denoted generally by the reference numeral 11.

On the shaft there is mounted a plurality of coils in two banks viz. an outer bank of coils 12 of a diameter slightly less than that of the casing of the crystallizer 11 and an inner bank of coils 13, which may be of opposite hand, of smaller diameter.

The outer bank of coils 12 is connected with the inlet passage 7 at spaced intervals by means of connections 14 and with the outlet passage 6 of the shaft 1 by means of connections 15. Similarly, the inner coils 13 are connected to the inlet side 7 and outlet side 6 of the shaft 1 by means of the respective connections 16 and 17. The connections, 14, 15, 16 and 17 enter their respective passages on the shaft 1 by means of plates 18 provided with ports 19 welded on to the plates 3, which plates 3 are provided with ports in register with the ports 19.

As shown at the right hand end of Fig. 1 where the coils 12 and 13 are shown in section, the cooling or heating medium may be arranged to flow in the coils 13 from right to left as indicated by the arrow *a* and from left to right in the outer coils 12 as indicated by the arrow *b*.

With the coils 12 and 13 of opposite hand rotating in one direction a flow of the massecuite is induced in the directions shown by the arrows *c*, *d*, which thus prevents the massecuite building up at one end.

As shown in detail in Fig. 7 the inner and outer coils 13 and 12 are attached to channel members 20 by means of a half-round bearer block 21 and stirrup 22 bolted to the channel member 20. The channel members 20 are supported on arms 23 attached to the shaft 1.

In the embodiment shown in Fig. 5 the shaft is assembled by welding two channel sections 27 facing one another with an interposed plate 24 forming the inlet and outlet passages 7, 6. Plates 18 provided with ports 19 which are in register with ports 19^1 in the base of the channel section 27 are welded along the shaft for the attachment of the coils 12, 13.

In the arrangement shown in Fig. 6 the shaft is formed of spaced channel members 27 oppositely disposed and connected by an H beam 25. Plates 18 are welded to the flanges 26 of the members 27 forming with the section 25 the inlet and outlet passages 7, 6.

The coils 12, 13 may be all of right hand spiral or left hand spiral or a combination of both.

While with the improved construction of shaft intermediate bearings with water connections are unnecessary, stirrup or other bearings may be provided to support the shaft intermediate its length.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A sugar crystallizer having a shaft consisting of standard rolled sections and plates assembled in a fluid tight manner to provide a partition presenting longitudinal channels or passages for the supply and exhaust of heating or cooling fluid to and from coils or banks of tubes mounted on the shaft.

2. A sugar crystallizer having a shaft consisting of standard rolled sections and plates assembled by welding to provide a partition presenting longitudinal channels or passages for the supply and exhaust of heating or cooling fluid to and from coils or banks of tubes mounted on the shaft.

3. A sugar crystallizer as claimed in claims 1 or 2 in which the coils are arranged in two banks one inside the other, the two banks of coils being of opposite hand.

4. A sugar crystallizer as claimed in claims 1, 2 or 3, in which a trunnion is provided at each end of the shaft, one trunnion serving as an inlet for the heating or cooling medium to one of the longitudinal passages, and the other trunnion serving as an exit for the heating or cooling medium from the other passage.

5. A shaft for use with a sugar crystallizer constructed and arranged substantially as described with reference to Fig. 5 of the accompanying drawings.

6. A shaft for use with a sugar crystallizer constructed and arranged substantially as described with reference to Fig. 6 of the accompanying drawings.

Dated this 4th day of March, 1937.

CRUIKSHANK & FAIRWEATHER,
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and
86, St. Vincent Street, Glasgow,
Agents for the Applicant.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1937.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

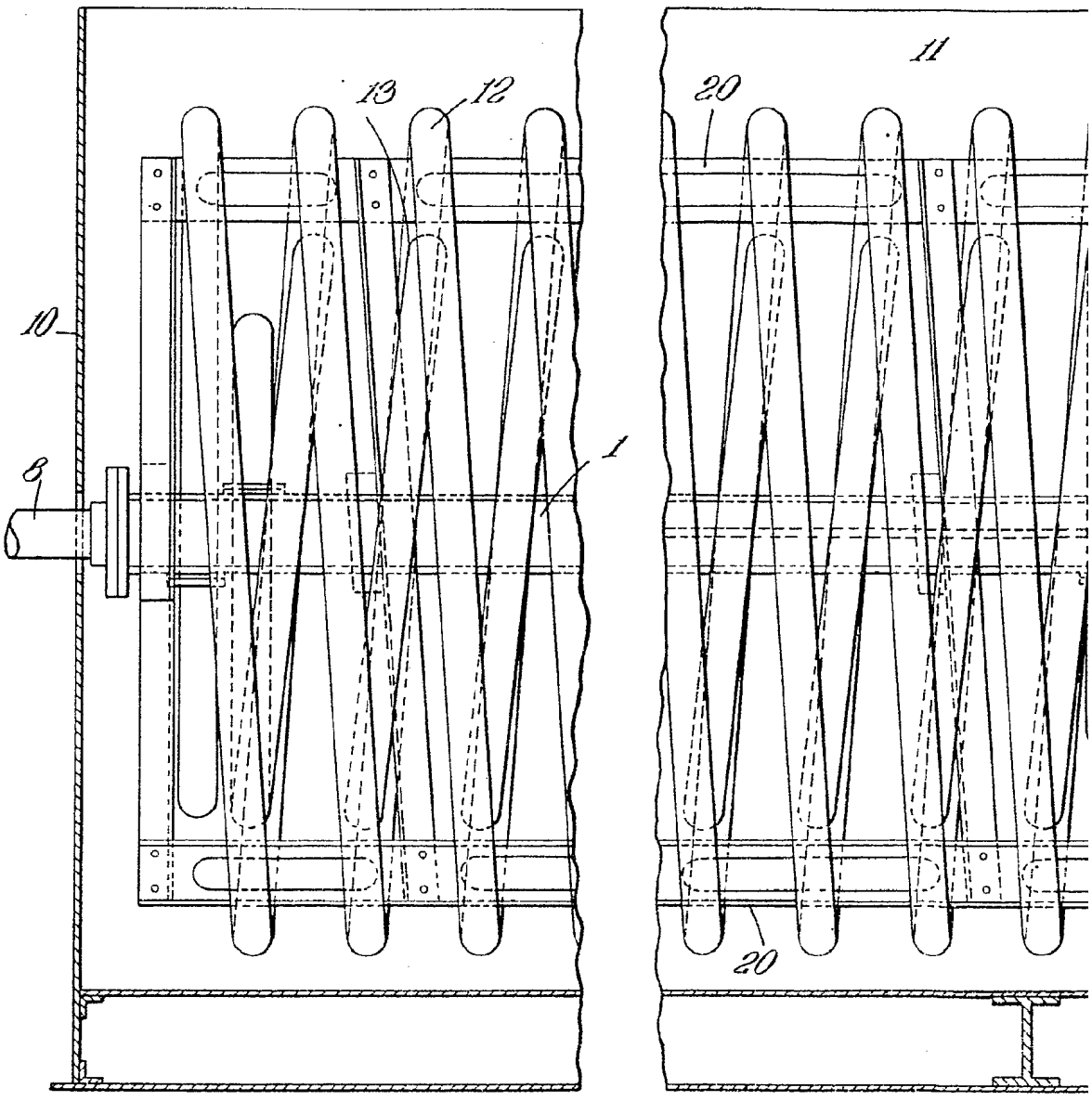
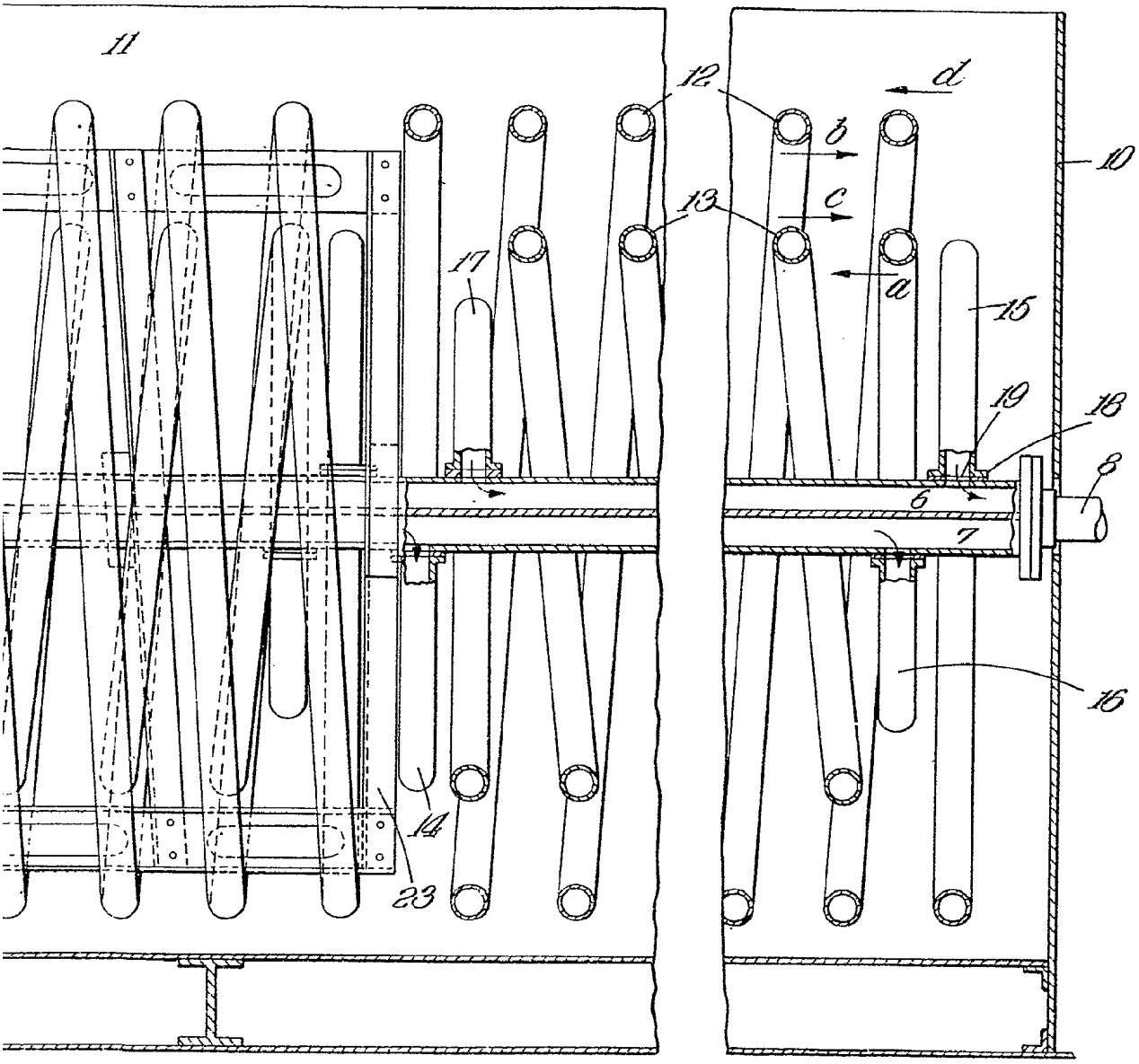


Fig. 1.



2 SHEETS
SHEET 1

469,771 COMPLETE SPECIFICATION

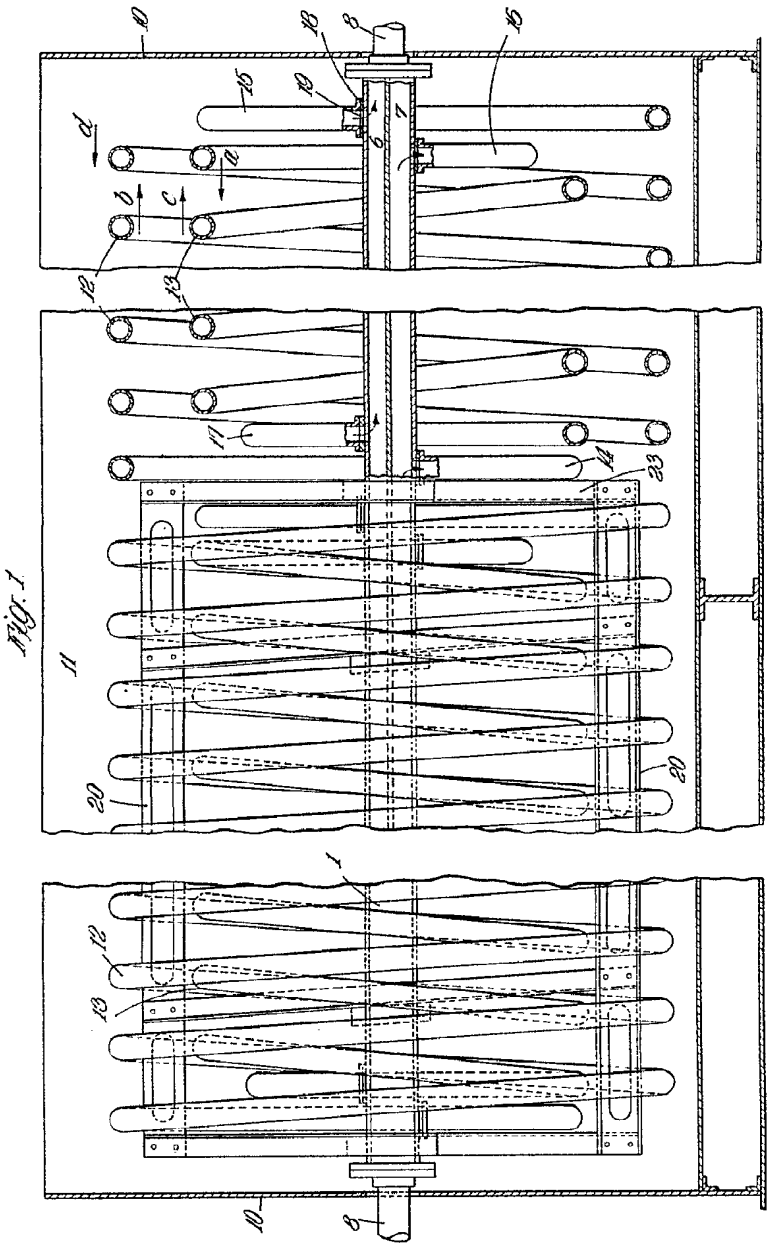


Fig. 1.

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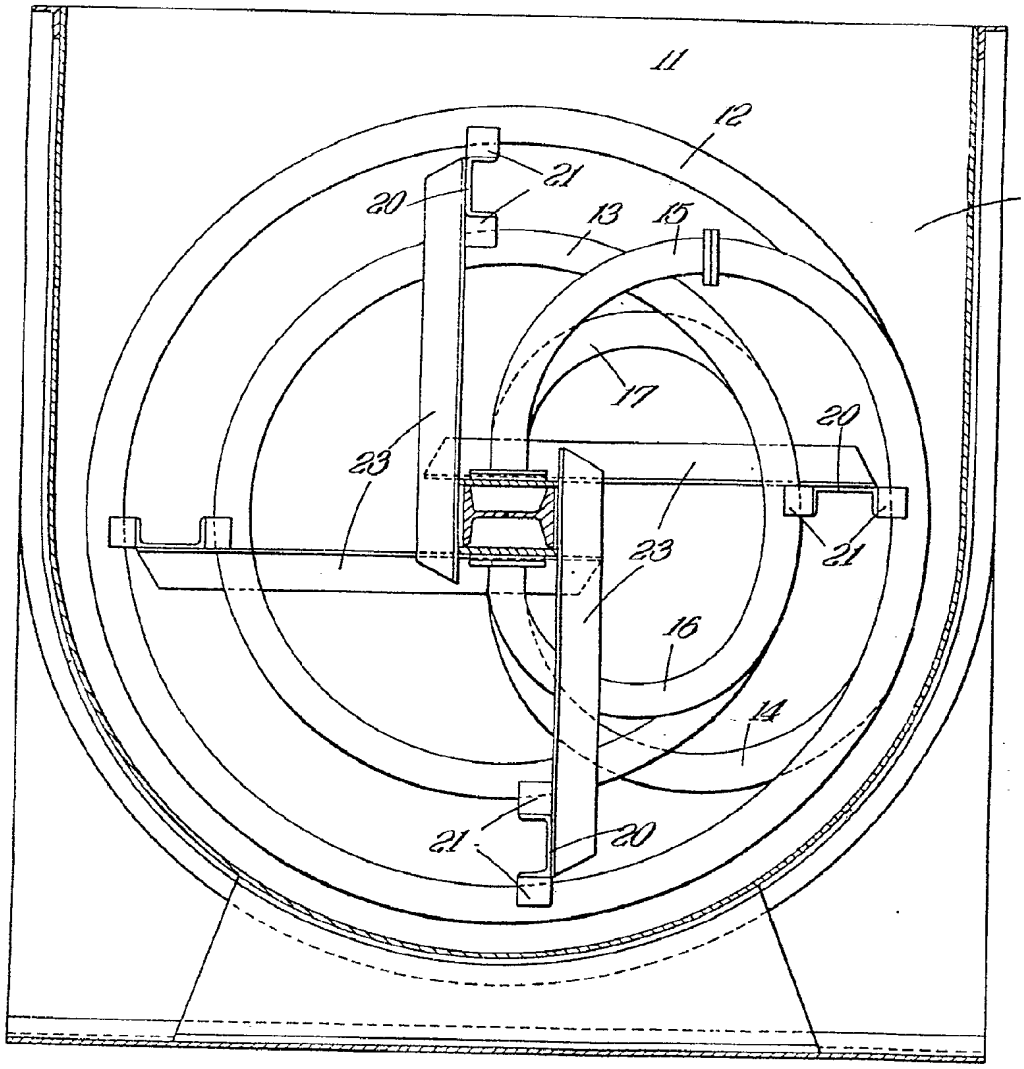
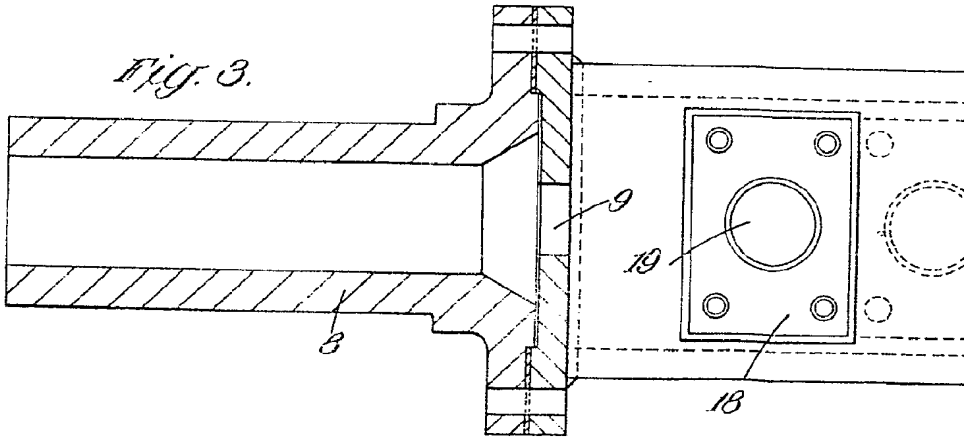


Fig. 3.



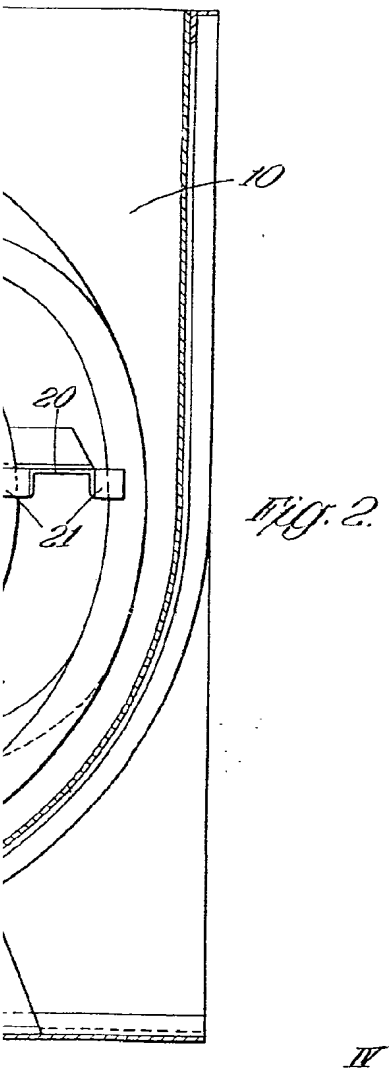


Fig. 2.

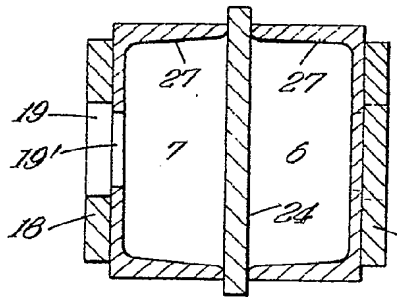


Fig. 5.

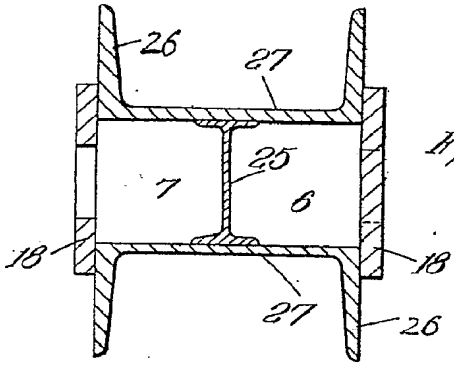


Fig. 6.

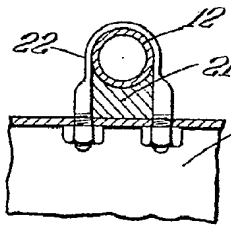
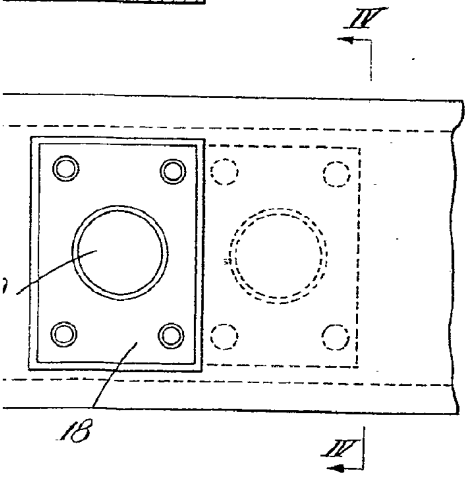


Fig. 7.



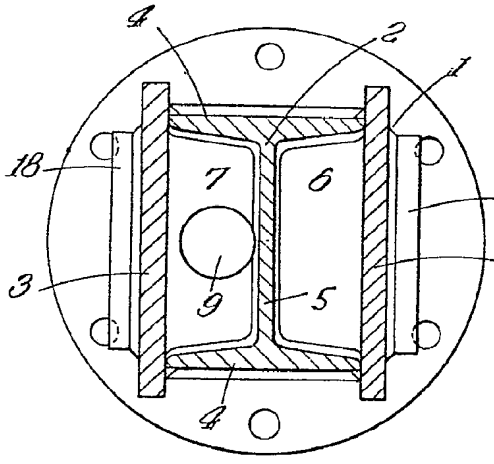


Fig. 4.

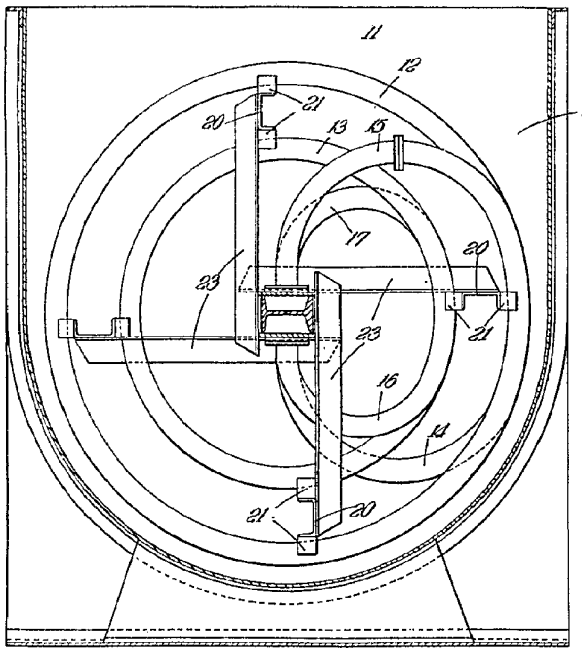


Fig. 2.

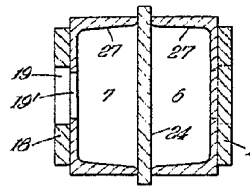


Fig. 5.

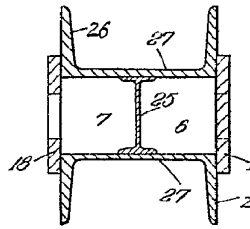


Fig. 6.

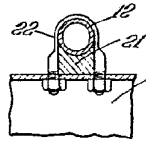


Fig. 7

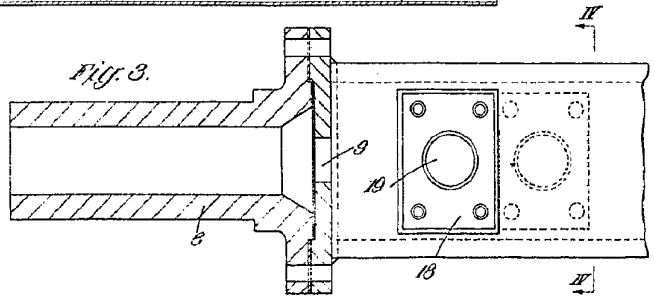


Fig. 3.

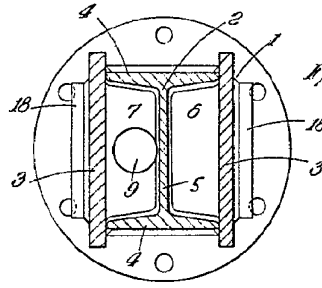


Fig. 4.

Malby & Sons, Photo-Lith.